DOCUMENT RESUME

ED 229 267 SE 041 549

AUTHOR Rowe, Robert D.
TITLE Muglamp Community School Field Report. Indigenous Mathematics Project. Working Paper 10.
INSTITUTION Indigenous Mathematics Project, Port Moresby (Papua New Guinea).
SPONS AGENCY Papua New Guinea, Dept. of Education, Port Moresby.; United Nations Educational, Scientific, and Cultural Organization, Paris (France).
PUB DATE Nov 80
NOTE 26p.; For related documents, see SE 041 540-555.
PUB TYPE Reports - Descriptive (141) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Cross Cultural Studies; Cultural Influences; *Curriculum Development; Educational Research; Elementary Education; *Elementary School Mathematics; Ethnography; *Field Studies; Language Role; Mathematical Vocabulary; *Mathematics Curriculum; *Mathematics Instruction; Teaching Methods; Textbooks; Workbooks
IDENTIFIERS *Indigenous Mathematics Project; Mathematics Education Research; *Papua New Guinea

ABSTRACT

This report summarizes field work in Muglamp, Papua New Guinea, one of five community schools participating in the ongoing research and development efforts of the Indigenous Mathematics Project (IMP). It begins with an introduction to the site, the school setting, and the community setting. The teacher's history and the number of students in one grade 2, one grade 4, and two grade 6 classes are briefly noted. The evaluation of instructional activities indicated that the teacher did not have many problems implementing the lessons, although some suggestions were made to improve the teacher's notes. The learning aids were in general found to be appropriate and effective. Observations of language-use revealed that lessons were taught in English and Pidgin, with the latter used in decreasing amounts in grades 4 and 6. Classroom interaction was noted as predominantly teacher-centered, with questioning used often. Finally, student interviews are briefly reported. Overall, the IMP materials were found to be well-designed for this site. (MNS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED229267

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Randall Souviney

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

INDIGENOUS MATHEMATICS PROJECT

SE041549

MUGLAMP COMMUNITY SCHOOL FIELD REPORT

Robert D. Rowe

Working Paper 10
November 1980

THE INDIGENOUS MATHEMATICS PROJECT

This series of working papers and research reports has been published to provide a comprehensive source of documentation on research and development efforts associated with the Indigenous Mathematics Project. The Project was established in 1977 by the Government of Papua New Guinea to investigate various aspects of traditional mathematics development. During the first phase (1977–79) of the five year program, basic research in crosscultural cognitive development was carried out and indigenous counting, classification and measurement systems used throughout the country were documented. During the second phase of the project (jointly funded by the Department of Education and UNESCO), pilot instructional materials were developed and trialled. The intent was to assess the feasibility of utilizing complementary aspects of indigenous and Western mathematics as a basis for developing culturally relevant student materials, instructional aids and teachers' guides which reflect the practical constraints of the community school environment. The results of IMP work are intended to inform future curriculum development in an effort to provide more appropriate instructional materials and learning aids for Community Schools throughout Papua New Guinea.

Series Editor: Randall Souviney
Managing Editor: Jacquie Wathen

INDIGENOUS MATHEMATICS PROJECT

Field Report

MUGLAMP COMMUNITY SCHOOL

14 July - 22 August 1980

by

Robert D. Rowe

710 Third Street
Encinitas, California 92024
United States of America

This report summarizes field work carried out at one of five community schools in Papua New Guinea participating in the ongoing research and development efforts of the Indigenous Mathematics Project.

Muglamp Community School is situated in a developing agricultural area approximately seventeen kilometres northwest of Mount Hagen. The community has relatively easy access to Mount Hagen through a Public Motor Vehicle (PMV) system. This loosely organized system provides transportation into town three times each day. The cost of a one way trip from Muglamp to Mount Hagen is fifty toea per person. The condition of the two roads to Mount Hagen depended to a great extent on the current weather conditions and the responsiveness of the maintenance workers. A rock foundation was being laid on parts of the northern road in preparation for sealing. However, due to the lack of funds the project will not be completed for several more years.

Environment

The Muglamp area was once a deep lake. Over the years it filled with silt run off from the surrounding mountains. Twenty years ago the Muglamp area was still predominantly swamp land and meadows of Kuni grass. In 1960 a few families moved down from the mountains and settled on the outskirts of the swampy grasslands. The land left by the receding lake provided the settlers with rich, fertile soil. Subsequently various types of trees were planted, gardens developed and gradually a community emerged. Since then cash crops have flourished in these ideal environmental conditions at an altitude of about 1800 metres and a temperature range of 18 - 22 degrees C. The Gumanch Coffee Plantation next to the school employs a large number of workers from the area and contributes significantly to the economic base of the region.

Housing and Supplies

Housing and supplies in the Muglamp area are generally quite good. This could be attributed to three factors: resources available from cash crops; an adequate transportation system to Mount Hagen for people and goods; and the establishment of the District Station at Muglamp providing the local people with political representation and access to Western technology.

The district patrol officer, a magistrate and civil engineer from New Zealand, hired by the Dei, Mul and Baiyer councils, and their families occupied three western style homes. These houses had indoor

plumbing, butane gas , hot and cold running water, gas stoves and heating. A fourth home of the same type had recently been completed but it remained unoccupied. The other permanent structures in Muglamp besides the school consisted of a minimum security prison and housing for the officers in charge.

All the teachers were provided with permanent housing except for the two youngest male teachers. Most of the houses had electricity. The houses ranged in size from thirty to forty square metres, with the headmaster's and senior teacher's houses being the largest. The houses had two bedrooms, a small bath area and a larger main room that was often divided into two rooms by a partial wall. One side was the kitchen area and the other was the eating and working area. The kitchen had a sink basin with a drain (but no running water) and a cast iron wood burning stove. At the time plenty of wood was available for fuel since trees had been planted when the community was originally established. However there was some concern about the potential lack of wood in the future.

Each household had a modest amount of furniture usually including a couple of metal framed beds, a table with benches, and a few metal cabinets. Rain water for drinking, cooking and washing was collected in large corrugated iron tanks from roof run-off. Every household had their own pit toilet located at some distance behind the house.

Except for three or four trade store owners people lived in traditional rectangular kuni grass houses. The trade store owners usually lived in a few rooms in the back of their store. One trade store owner had a separate permanent building next to his store.

Most of the teachers had their own gardens. The gardens contained kau kau, corn, taro, cabbage, beans and peanuts. The school grew coffee, pineapples, chilies and bananas for cash crops. Each grade also had their own garden of corn, kau kau, cabbage, peanuts and beans. At the local trade stores items such as flour, canned goods, sugar and frozen chickens, lamb and fish could be purchased.

Initial Reactions

I was filled with excitement and energy as our plane approached Mount Hagen. In contrast to Port Moresby our first breath of air upon leaving the plane was cool, refreshing and exhilarating. The wild poinsettias and lush hillsides were awe-inspiring.

Venina Kada, IMP Research Assistant, had arranged a government vehicle to take us to the site. The teachers and about twenty children greeted us enthusiastically when I arrived, dispelling any apprehension I may have had. Within the first few days I realized how fortunate I was to be assigned to work with the teachers at Muglamp Community School.

History of Schooling

The Seventh Day Adventists set up a pre-school in the Muglamp District near Pagalum to teach Pidgin around 1960. In 1962, the Australian Administration established a school at Bakalaka. The school site was moved in 1965, by Councillor Maip Kay, from Bakalaka to its present site near Muglamp. The present site was a much larger site, which would allow ample room for expansion. Since that time the school has grown steadily to its present size with eight teachers servicing 233 students.

Curriculum Materials

Instructional materials were very limited. Most children wrote with five centimetre long pencil stubs in exercise books which were almost full. There were no replacements. The reading books appeared to be in good condition and were in sufficient quantity for all the children. Other available texts for students (Pacific Series for reading and writing, Voager Arithmetic and various English books) were in very poor condition and subsequently rarely used. The teachers had the appropriate syllabuses for the different subject areas issued by the Department of Education. These were in fair condition and used daily.

Equipment

Compared to other schools Muglamp had a substantial amount of working equipment. The school had an old typewriter, duplicating machine (working), chalk, brushes (no paints), rulers for about ninety

percent of the children, six old maps of Papua New Guinea and the world. The teachers took pride in their care and maintenance of the equipment. Money obtained from selling the crops from the school garden was used for new equipment and maintenance of existing equipment. They also had a variety of sports equipment which included three volleyballs, three basketballs, two softballs, two soccer balls, three bats, thirty hoops, two volleyball nets and a basketball court. Five teachers owned their own radio-cassette players which they shared with the other teachers.

The following tables give information on the student population at Muglamp Community School, the daily time schedule and the minutes of instruction each week.

STUDENT POPULATION

Grade Level	Years Exper.	No. of Boys	No. of Girls	Total	Mean Age $\bar{x}$
1	9	13	21	34	7.1
1	14	13	23	36	8.1
2	5	12	9	21	7.6
3	5	16	11	27	9.4
4	1	26	19	45	10.9
5	4	15	11	26	13.2
6	1	12	9	21	12.5
6	6	14	9	23	12.3
Total	$\bar{x}$=5.6	121	112	233	$\bar{x}$=10.2

DAILY TIME SCHEDULE FOR SCHOOL

8:30 - 8:45 out-door assembly (M, W, and F)
8:30 - 8:45 in-door assembly (T and Th)
8:45 - 10:00 class
10:00 - 10:30 recess
10:30 - 12:00 class
12:00 - 1:00 lunch
1:00 - 1:30 class
1:30 - 2:45 community activities
2:45 - 3:30 religious instruction
3:30 - 4:50 work parade (3:30 - 4:30 M, W, Th)

MINUTES INSTRUCTION PER WEEK

Grade Level	Math	English	Science	Community Life	Art	PE	Other	Total
2	210	585	30	90	180	90	120	1305
4	210	585	40	240	210	60	120	1465
6	210	510	60	300	210	120	120	1530

Summary and Comments

Muglamp school is part of a developing agricultural community which includes the District Police Station and prison, Court and Patrol Station. Excellent soil and climatic conditions allow the community and the school to maintain very productive gardens. The coffee production at the school contributed over 700 Kina this year to the purchase of education materials. Teachers, parents and students seem willing to work very hard to improve the conditions of the school and the community. The teachers felt committed to the students and spent the school's money on sports equipment, instructional supplies; not on themselves.

Community Setting

Seven villages and a few students from the Gumanch Plantation were serviced by the school. Though it was very difficult to get accurate figures, we estimate roughly sixty percent of the school aged children in the area were enrolled in school.

Village	Distance to School (Kilometres)	Total Population (Estimate)
1. Mikitimb	3.5 km	350
2. Molga (Polgi)	7.0 km	900
3. Muglamp One and Two	5.0 km	650
4. Bakalaka	2.0 km	550
5. Keta	8.0 km	500
6. Karalo	4.0 km	400
7. Pagalum	5.0 km	600
8. Gamanch Plantation	3.0 km	

All families had some shared or private land on which to cultivate

their gardens. Pineapples, bananas, taro, kau kau, corn, ginger, beans, coffee and other crops were grown. With the exception of a few trade stores and churches, most village housing was constructed from bush materials. The climate was moderate (20 degrees C. during the day; 10 degrees C. at night) with adequate rainfall in the afternoons and evenings.

Most people of the area attend the Catholic Mission at Mun with a lesser number attending the Lutheran Mission. There are also a few SDA (Seventh Day Adventist) families who moved to Muglamp because of their work (police, etc.).

The area is rapidly assimilating urban (western) traits. Most of the school boys wore shorts and shirts. The young men in the village wore some western clothes in addition to the traditional bark belt and leaves. The older men predominantly wore laplaps or traditional leaves. However, many elderly men wore old jackets and hats, and carried umbrellas. Women predominantly wore laplaps. A few of the very old women still wore some form of traditional grass skirts. In general the community was gradually moving towards a westernized lifestyle. The relatively easy transportation into Mount Hagen contributed to this transformation as well as the increasing number of outsiders doing business in Muglamp.

The local political structure consisted of the District Magistrate who ran the District Court and lived in Muglamp, and village level magistrates who ran the village courts and were responsible for minor offenses. Nine council members represented the local villages in the Provincial Government. Eleven Board of Management members represented the councillors in overseeing the school activities. These men were independently elected by each village, and became very important in the village affairs. The following table lists the members of the School Board of Management.

SCHOOL COMMITTEE

Name of Board Member	Position	Councillors
1. Wimba	President	Rumints
2. Kume	Vice-President	Kume
3. Rui	Treasurer	Dos
4. Roimp	Committee	Raima
5. Korowa	Committee	Koi
6. Pongum	Committee	Maip
7. Kuki	Committee	Undakundi
8. Numdi	Committee	Pagum
9. Kil	Committee	Wanopa
10. Dou	Headmaster	
11. Gimang	Teacher Representative and Sectretary	

Language-Use in the Community

The language used in the area was predominantly Melpa. Older people used Melpa exclusively. Middle-aged people understood and used both Melpa and Pidgin. A few knew and used some English. Young people generally understood and used Melpa, Pidgin and, primarily at school, English.

Traditional Education and Socialization Processes

Women were in charge of almost all the infant care. However, when boys became old enough to walk men would take them under their guidance and teach them how to garden, make fences and build houses. The women would continue to keep the girls under their guidance to teach them gardening, cooking, child care and village crafts.

The clan structure was based on the extended family. Members usually remained close in order to help one another. Many times daughters moved to neighbouring villages because of marriage. Inter-marriages seemed to have a definite moderating effect on hostilities between villages.

Community Life - School Performance

The rapid westernization and development of the Muglamp area seems to have had an effect on the performance of the children in the school. Because there were several trade stores in the area many children wanted to run a trade store of their own. This goal seemed to motivate many children to work hard at school. Also having the Police Station, Magistrate and Patrol Officer stationed in Muglamp exposed the children to professional people and western role models. The well established coffee plantations and vegetable gardens offered models of commerce. All these factors placed increasing demands on language and mathematical skills.

Teacher's History

E. attended a Catholic Mission Station at the age of four or five, where he learned "the good news of God", simple arithmetic and the alphabet. In 1963, at age six, he was chosen to go to primary school at Marienberg in Lower Sepik. By 1966, there were not enough teachers at the school so he was transferred to Kapaimary along the Middle Sepik for grade four. In 1967, he transferred to Biwat for grade five. He completed grade 6 in 1968 at Brui.

E. went to high school from 1969 to 1972 at St. Xaviers on Kairiru Island, Wewak, East Sepik Province. He was told by his parents that he was to become a teacher. He applied and was accepted at St. Benedicts in the East Sepik Province and attended from 1973 to 1974. He had to repeat his second year of training at Holy Trinity Teacher's College in Mount Hagen because of conflicts with the Headmaster at St. Benedicts.

In 1976 he taught grade one at Tarangau in Mount Hagen. From 1977 to 1979 he taught grade two, three, and four at Winiy, located in the Baiyer River area. At the end of 1979, he was "inspected" and given a level two status. He was appointed Senior Teacher at Muglamp for the 1980 school year and was teaching grade three during the time of this study. He appeared to be competent and conscientious, a teacher who loved his work. He was clearly motivated and willing to work hard.

Subject Sample

Four classes were involved in the study. Daily observations were made in a grade two, four and six class. An additional grade six class served as a paired control class and participated in the testing only.

EXPERIMENTAL AND CONTROL CLASSES

Grade Level	Boys	Girls	Total	Mean Age ($\bar{x}$)
2	12	9	21	7.6
4	26	19	45	10.9
6	14	9	23	12.3
6 (control)	12	9	21	12.5
TOTAL	64	46	110	$\bar{x}$=10.9

Because the grade four class was extremely large it was difficult to consistantly keep the students' attention and correct their work. The other classes were a more reasonable size making it much easier for both the students and the teacher. The control class (grade six) was somewhat older than the experimental grade six class ($\bar{x}$=12.5 vs $\bar{x}$=12.3). A few students in the control class were fourteen, fifteen and sixteen years old.

A total of 43 subjects were interviewed to assess relative cognitive ability using a battery eight standard tasks (see IMP Working Paper No. 3). Over 100 subjects were administered pre- and post- mathematical achivement tests.

SUBJECTS ASSESSED

Grade Level	COG	PMAT 2	PMAT 3
2	13	19	21
4	15	42	40
6	15	25	24
6 (control)		24	19
TOTAL	43	110	104

Teacher's Questions and Comments

E. and I quickly developed a good rapport and were able to talk easily. Our interactions were somewhat formal in the beginning but became very relaxed by the end of the first week. We established a routine for the "Preliminary Interviews" so my questions soon developed into meaningful discussions. In time my role became more that of a passive listener. Only when E. became confused by a lesson (e.g. 149D) would I take on a more active role.

Generally speaking E. had four different types of questions and comments about the lessons. The first pertained to lesson instructions which were unclear. The second type concerned basic classroom organization procedures for the lesson. Third he offered suggestions and recommendations on how the lessons and instructions could be made clearer to the teacher and students. And finally he made comments describing how he planned to restructure and modify the lessons for implementation.

Implementation Problems

In general E. did not have many problems implementing the lessons. He was well organized and prepared. He usually had the insight to forsee potential problems and modify the lessons to avoid them. The only significant problems occurred in grade four where the large class size seemed to hinder the success of some lessons. The lessons for grade four always required more energy to implement. It was very difficult to keep everyone's attention. Also the teacher had considerable difficulty assessing which students were having trouble in order to provide additional help.

EVALUATION OF INSTRUCTIONAL ACTIVITIES

In this section the actual lessons are reviewed by grade level and recommendations are made for the improvement of materials and aids.

Grade Two

Classification: Only two classification lessons were attempted and they went fairly well. E. felt that the lessons needed to be more

structured by the teacher. He felt that giving each group all the Kina Cards (attribute materials) at one time was overwhelming. These lessons could be improved by making them more teacher directed and by having the students work with only one attribute and a few Kina Cards at one time.

Measurement: These lessons needed some modifications. E. felt that they should focus more on student activity rather than on written work in their exercise books. He also felt more emphasis should be placed on comparison activities (e.g. lesson 55C).

Number Operations: Except for 53A and 53B, almost all of the Number Operation Activities went well. However, most of the lessons were altered by E. in one way or another. He was the most creative with the grade two lessons and avoided problems effectively. Detailed descriptions of his modifications of lessons are given in the field notes. The number activities using coins and base-10 materials were very successfull successful.

Grade Four

Classification: At first these lessons were very hard to implement because the class was so big. Subsequently, we moved the class to a larger room. E. modified the lessons by chalking the "roads and houses" on the floor. The diagrams were about four metres by three metres which allowed the children to actually walk down the roads and read the attribute signs. While the lessons proved to be successful, E. felt it took a bit too much preparation time.

There should be more instruction to the teachers explaining "and" and "or" roadways. It was also evident that the students needed more detailed explanations and experiences with the concept of "not". In general the relational clock games were very confusing.

Measurement: Due to time limitations, the 148 measurement series was not implemented.

Number Operations: The 144 series should include a lesson on "equal" parts in relation to the concept of fractions. All answers

should be provided for the teachers as well. Also, in the examples, each fractional part should be labelled. The 149 series on multiplication of whole numbers (squared paper multiplication blocks) was very difficult, especially 149D. The teacher never really understood that the aim of the series was to provide the students with a concrete method for generating the multiplication table. The children had a good deal of trouble just making the multiplication blocks.

Activity 149E required considerable teacher preparation. The flash-card games should be separated into two distinct lessons. The first game (4x5=?) should be played many times before game two is introduced. The latter (20=3x?) was considerably more difficult. Lesson 149G (multiplication) should proceed 149F (division) since constructing the multiplication arrays was much easier than figuring out the division mats.

Grade Six

Number Operations: The teacher and students thought the opening lessons about counting systems were extremely interesting. However, most students were not familiar with their traditional counting system. Perhaps a local villager could participate in some of these initial lessons and contribute his or her knowledge of the traditional counting system.

The games went very well, but the teacher usually gave more explicit instructions than those written in the Teachers' Notes. The multifact game proved to be very difficult because most students didn't know their multiplication facts. More activities should be included that focus on reviewing basic addition and multiplication facts. The lessons with the base-10 materials were laid out well in the teachers' guides and went smoothly. The most effective and successful lessons were organized as follows:

1. Teacher demonstrated method or activity to whole group.
2. Teacher directed the class through the same problems step-by-step.
3. The class worked through similar problems or exercises independently or in small groups.

The multiplication lessons 6 - 22 through 6 - 24 were very successful. The teacher felt the curriculum did not sufficiently wean the students away from the dependency on place-value tables. Thus when it came time for a test presented in a standard symbolic format the problems may look unfamiliar to the students. There also seemed to be a need for more practice with representational (pictorial) models of the base-10 materials.

Evaluation of the Teachers' Notes

Aside from basic editorial and graphic problems the Teachers' Notes were useful and understandable. Rational for including certain activities and aids would be useful. Also some explanations of complicated manupulative processes should be expanded. A brief test at the end of each topic would assist the teachers in assessing student progess. More illustrations and worked examples would be helpful as well.

Recommendations:

1. Provide explicit step-by-step instructions.
2. More worked examples should be included in the teachers' guide and the students' text.
3. More illustrations are needed throughout.
4. Specific background rational on the content and methodology should be provided at the beginning of each section.
5. Topic tests should be included in the teachers' guide or student text.

Evaluation of Learning Aids

In general the learning aids were appropriate and effective. The aids provided a great deal of motivation for the students and they held up well under use. The teacher appreciated that the materials supplied required minimal preparation time.

Base-10 Materials: Base-10 materials were perceived as the most valuable aid. They were in general used correctly and seemed to be a particularly effective means for developing place-value and whole number concepts.

Kina Cards: The children loved using the Kina Cards. They stood up well under repeated use. Often the teacher and students referred to the Kina Cards by their outer shape. For instance, the students would call the fish a "diamond" and the shell a "circle".

Coin Cards: The coins were a big hit and many of the other teachers at the school wanted to use them. E. was going to use them in a play trade store that he planned to set up on his grade three class during term four. The only problem involved the silver paint which came off easily. The students rubbed it all over themselves.

Measuring Devices: The trundle wheel was the only measuring device used. It was used by the teachers to measure the school's dimensions for a map being prepared for this project. The other devices seemed well constructed, but due to time constraints they were not used during the trialling period.

Squared Paper: The squared paper was used for arithmetic exercises and worked very well. In an attempt to conserve resources the teacher often supplied the children with insufficient squared paper to complete their exercises. E. developed a number of duplicating masters to make the lessons more efficient. The younger students in particular had trouble with lessons which required copying the problems on squared paper in their exercise books. The duplicated worksheets aided in evaluating student progess as well.

The following table lists the lessons implemented over the six week trialling period. Those lessons which were documented using detailed implementation criteria are shown. The total lessons taught are given as well.

CURRICULUM IMPLEMENTATION LESSONS

Grade Level	Lesson Codes	Detailed Implementation	Total Lessons
2	53A, 53F, 53G, 53H, 53I, 55A, 56A, 56E, 57A, 57I-1&2, 58A, 58B.	12	25
4	144A, 144C, 145A, 146A, 149A, 149B, 149F-1&2, 149G-1&2, 149H, 164A-1&2, 164B-1, 2&3.	11	24
6	6-1, 6-5, 6-12, 6-13, 6-14 6-16, 6-17, 6-18, 6-22, 6-23, 6-24, 6-25, 6-26.	13	26

Documentation Problems

After getting used to the "Field Guide" procedures, documenting classroom events went quite smoothly. However our initial plan of taking "rough" notes while the lessons were being taught and then rewriting all of the notes was unreasonable. There was a steady progression of falling more and more behind. It became clear that a new strategy would be necessary for documenting the lessons. Instead of initially taking rough notes I found it was possible to prepare the field notes in final form during the implementation of the lesson. Later I went over the notes to add or expand comments and wrote a lesson summary. This procedure allowed me to stay on schedule and complete the documentation prior to my departure from the site.

Language-Use

Initially I found it difficult to quickly recall the contextual codes while taking notes. However with practice it soon became reasonably easy to keep up with the pace of the teacher. Another problem involved keeping track of the names of students the teacher was addressing. He didn't call on them by name but often pointed or subtly cued someone to respond.

LANGUAGE-USE LESSONS

Grade Level	Lesson Code	Total
2	53C, 55B, 56B, 56F, 57B	5
4	144B, 144D, 145B, 146C, 149C	5
6	6-2, 6-6, 6-15, 6-19	4

Summary of Language-Use

Only English and Pidgin were used during instruction. The teacher was fluent in Pidgin and regarded it as a necessary aid to instruction especially with grade two students. Pidgin was used in decreasing amounts with grade four and six.

The teacher stated that he used Pidgin when trying to explain difficult concepts or when a child seemed confused. E. used considerable Pidgin with the grade two students. It seemed as if he relied on Pidgin more and more as the weeks went by. Pidgin was used when the frustration level of the teacher became very high. Frustration was generally related to the teacher's perception of how well the class was understanding a particular lesson or task. Tok ples was frequently used by students during recess and after school hours.

Classroom Interaction

Initially it was difficult to recall and record the codes quickly enough to document classroom events in real time. Often interactions would occur at such a rapid pace that it was impossible to document them as discrete events. It was necessary to go over the tapes and recheck each interaction in order to ensure a complete description of each lesson. Further analysis will be possible once transcripts of the taped lessons are completed.

Another problem involved determining the identity of the addressee. As I became familiar with the students the task became easier, however the notes never seemed to be totally complete. Another problem involved differentiating the type of question asked. With practice these difficulties diminished over time.

CLASSROOM INTERACTION LESSONS

Grade Level	Lesson Codes	Total
2	53D, 55C, 56C, 57C.	4
4	144E, 145C, 146D, 149E	4
6	6-3, 6-7, 6-9, 6-21, 6-28	5

Summary of Classroom Interaction

Classroom Interaction could be characterized as predominantly teacher centred. Generally the lesson started with E. asking questions directed at the whole class. He would usually accept individual call-out or chorused responses. When he wanted the whole class to respond he would cue them by the way he structured the question or with his voice intonations.

The middle phase of the lessons would usually be Teacher-Individual nomination type interactions. If through this interchange he assessed that a child didn't understand the current task he often would continue with questions directed to the whole class.

The last phase of the lesson frequently involved review and assessment. Interactions during the review phase were generally open invitations to bid with chorus or call-out responses. Occasionally individual nominations would be specified, where the teacher would thoroughly quize one or more individuals.

It should be noted that E. often used questions as a means of teaching a lesson. Rather than explaining each step in a procedure he would ask leading questions. Inevitably, one or more students would respond with the correct answer. The teacher then assumed that everyone in the class understood the lesson, when in fact, many apparently remained confused. The teacher would proceed with the lesson assuming everyone was comprehending the lesson. Structuring the curriculum to ensure that the teacher explains each detailed step of a lesson might be one way to minimize this potential problem.

Student Interviews

The first problem encountered with regard to conducting a useful student interview was finding students who were comfortable talking about themselves and their school experiences. Fortunately, with E.'s help, a number of students emerged during the first weeks who were comfortable talking with me about their lessons.

The interviews usually required a good deal of time to complete. Since they generally took place in the later part of the afternoon, the students were often tired and anxious to go home. No other time could be made available however, so we made the best of the situation.

STUDENT INTERVIEW LESSONS

Grade Level	Lesson Codes	Total
2	53E, 55D, 56D, 57D	4
4	144F, 145D, 146B, 149D	4
6	6-4, 6-8, 6-10, 6-20	4

Summary of Student Interviews

The student interviews proved to be extremely interesting and valuable. They gave me immediate feedback on the lessons which was not available from observations or teacher discussions. In particular the students provided insight into their understanding of particular concepts and perceived relationships between mathematical ideas. The interviews also offered insight on the discrepancy between what the teacher considered as successful and what the students really understood in the lesson. The interviews gave a clear picture of how the students were misinterpreting the teachers instructions. Perhaps the teacher should conduct occasional interviews with selected students in order to more adequately assess student progress.

SUMMARY AND CONCLUSIONS

Muglamp Community School was overall a well functioning educational

facility. The school was well organized and run with pride and enthusiasm. Both the school grounds and the school's equipment were superbly maintained by students, teachers and parents. They relied heavily on their ingenuity and natural resources since supplies were limited.

The teachers at Muglamp school were in general professional and dedicated. They valued the educational system and were committed to the students, even though many of the teachers were from other regions in the country. Teachers exhibited warmth and were firm yet fair in dealing with the children.

Education at Muglamp was a serious undertaking. The local villagers percieved education as important and vital to the community's growth and wellbeing. However, parents knew it was essential for their grade six children to go on to high school if they were to get good jobs. This situation put pressure on the teachers and created resentment in many of those families whose children were not accepted into high school. Some of these parents regretted having sent their children to the community school and felt schooling without high school had done more harm than good by interfering with traditional child rearing practices. Parents often felt that children who were unable to attend high school would have been better off if they had remained at home to help their families in a traditional manner.

Summary and Conclusions

The curriculum materials were well designed and organized. Both the teachers and the students found the materials not only enjoyable, but flexible and effective. Some lessons needed minor modifications in order to make the procedures clearer. These modifications were noted in previous sections of the current report and were detailed in the field notes and reviewed at the debriefing session at the Department of Education in Port Moresby following the field study. Finally it should be noted that other teachers at Muglamp reviewed the materials and were anxious to utilize the materials themselves. They appreciated the Department of Education and IMP's efforts to develop new texts and learning aids that they felt would personally benefit them as teachers.

Teachers were concerned about the use of language in the classroom. In general they expressed the attitude that while it was vital for children to learn English, communicating new concepts effectively was of equal importance. Thus teachers predominantly stressed and modeled appropriate English usage but used Pidgin or tok ples when the students needed help understanding a novel concept.

The Language-Use data revealed three basic trends. First, Pidgin and tok ples were used more extensively in the early grades. Second, by grades five and six the students were almost exclusively learning and functioning using English. Third, the teachers felt justified in using Pidgin or tok ples under certain conditions in order to maintain their effectiveness.

In conclusion improvement in student achievement was evident throughout the application of the trial curriculum materials. The teachers at Muglamp were open to new ideas and willing to work hard at mastering the maths curriculum in order to become more competent teachers. The trial curriculum was basically sound and subject to the recommended modifications would be appropriate for other schools. The key to success and improvement of the total maths programme lies not only with new curriculum materials but with adequate in-service training and other post-implementation teacher support. The finest of textbooks will be useless unless teachers are motivated to use them properly with their classes. It is interesting to note that the IMP teachers at Muglamp have taken it upon themselves to begin working with the other staff members in order to improve mathematics instruction throughout the school. The provincial inspector has shown interest by inviting Muglamp teachers to lead workshops throughout the Western Highlands.

Recommendations

1. A mathematics textbook should be developed as soon as possible for all grades in the community schools.

2. A detailed teachers guide should be developed with teacher input and supplied with the student textbooks.

3. The base-10 materials, Kina Cards and Money Cards proved to be most valuable as aids to instruction and should be provided to community school on a regular basis.

4. The measurement instruments were very well made and their use should be incorporated into the textbook.

5. In-service education must be an integral part of the whole curriculum development effort.

6. Teachers should be taught to evaluate students' knowledge and work by observation and criteria-referenced tests - not by just asking oral questions.

7. The following four-step lesson organization worked well:
   a) Explain the lesson step-by-step while simultaneously demonstrating the procedures of each step to the class.
   b) Direct the entire class to go through the same exercise step-by-step.
   c) Let the students work independently or in groups.
   d) Observe each child's work and identify those having trouble. Group those students having difficulties and give them special attention. Use frequent short tests to evaluate progress.

8. Encourage teachers to use Pidgin or tok ples during situations when the students are having trouble grasping the concept or skill being presented. This should apply especially to younger students.

INDIGENOUS MATHEMATICS PROJECT

WORKING PAPER SERIES

1. Learning to Compute.
   R. Souviney, January 1980.

2. Strategies for Mathematical Problem Solving.
   R. Souviney, March 1980.

3. Assessment Administration Guide.
   R. Souviney, April 1980.

4. Field Guide for Studying Classroom Events and Their Cultural Context.
   P. Levin, M. Gearhart and R. Souviney, June 1980.

5. International Congress on Mathematics Education.
   R. Souviney, V. Kada and D. Malaga; D. Lancy; M. Britt; B. Roberts, August 1980.

6. Andra Community School Field Report.
   P. Levin, November 1980.

7. Ororo Community School Field Report.
   J. Lineberger, November 1980.

8. Divanap Community School Field Report.
   M. Gearhart, November 1980.

9. Kero Community School Field Report.
   K. Johnson, November 1980.

10. Muglamp Community School Field Report.
    B. Rowe, November 1980.

11. Teachers Notes and Student Worksheets – Grade 2. 1980.

12. Teachers Notes and Student Worksheets – Grade 4. 1980.

13. Teachers and Students Text – Grade 6. 1980.

14. The Changing Form of Numerical Reasoning Among the Oksapmin.
    G. Saxe, January 1981.